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Indian Standard

METHODS OF TESTS FOR FLAMMABILITY OF AEROSOL PRODUCTS

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Indian Standard

METHODS OF TESTS FOR FLAMMABILITY OF AEROSOL PRODUCTS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 16 May 1977, after the draft finalized by the Metal Containers Sectional Committee had been approved by the Marine, Cargo Movement and Packaging Division Council.

0.2 This standard is one of a series of standards on aerosol dispensers. It lays down the methods of testing the flammability of the contents of the aerosol dispenser, that is, aerosol product to determine the flammability hazards of aerosol products.

0.3 The three methods of test given in this standard are based on the methods given in ASTM Standard D 3065-1972 ' Non-returnable metal aerosol dispensers ', published by the American Society for the Testing and Material.

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1. SCOPE

1.1 This standard lays down the methods of tests for the determination of flammability of aerosol products.

2. GENERAL

2.1 Three tests as given in **3.1**, **3.2** and **3.3** are suggested for testing the flammability of aerosol products. All the three tests should be used for each type of formulation tested because collectively these tests give a better overall check than any one separately. The three tests simulate the following conditions to which a filled aerosol dispenser can be subjected:

a) The flame projection test indicates how far a flame will extend beyond a burning taper if the spray from a pressurized dispenser is directed towards it. This is comparable to actual performance of the full complete mixture as sprayed.

b) The modified Tag open-cup test indicates what might be expected if there had been a leak, and after the propellant gas had been lost, the remaining liquid should be heated sufficiently to cause the remaining solution to boil or evaporate excessively.

c) The closed drum test indicates hazards, if any, that may result if one were to spray excessive quantities of different formulations in a confined space and there is a flame present; and also the result of varying degree of dilution of spray with air in the presence of a flame.

2.2 A unit shall be classed according to the lowest rating received in any one of the three tests.

3. TEST METHODS

3.1 Flame Projection Test

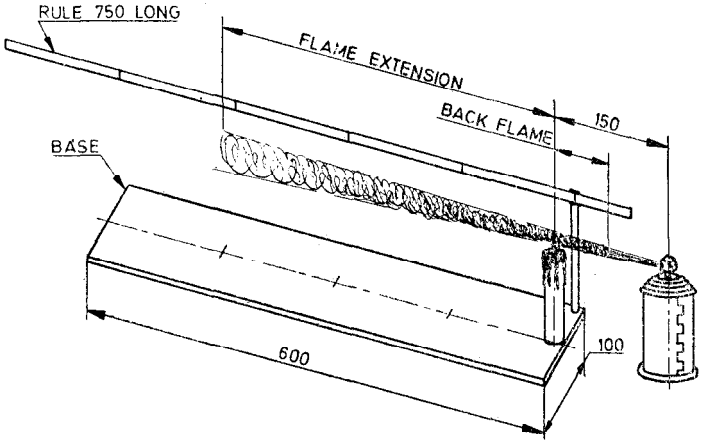
3.1.1 *Apparatus*

3.1.1.1 *Base* — 100 mm wide and 600 mm long, marked at 150 mm intervals.

3.1.1.2 *A rule* — 750 mm long and marked in centimetres to be supported horizontally on the side of the base and approximately 150 mm above it.

3.1.1.3 *Candle, paraffin* — approximately 25 mm in diameter and of such height that the top third of the flame is at the height of the horizontal rule, to be placed at the zero point of the base as shown in Fig. 1.

3.1.2 *Conditioning* — Condition the dispenser to 21 ± 1°C.



All dimensions in millimetres.

FIG. 1 FLAME PROJECTION TEST

3.1.3 *Procedure*

3.1.3.1 Conduct the test in a drought-free area that can be ventilated and the atmosphere cleared after each test.

3.1.3.2 Shake the dispenser and hold it upright unless the label states otherwise.

3.1.3.3 Position (place) the dispenser at a distance of 150 mm from the flame source and spray for 4 seconds (one observer noting the extension of flame and the other operating the dispenser) through the top third of 50 mm flame and essentially parallel to the rule.

NOTE — Caution — Do not spray large quantities in a small, confined area.

3.1.3.4 Record the results.

3.1.3.5 Free the space of any previously discharged material, and repeat **3.1.3.2** to **3.1.3.4** twice again, and average the three results.

3.1.4 *Classification* — Flammability of the aerosol product shall be as follows:

a) Pressurized dispenser producing flames at full valve opening over 200 mm at 150 mm shall be classed as combustible;

b) Pressurized dispensers producing flames at full valve opening over 450 mm at 150 mm shall be classed as flammable; and

c) Pressurized dispensers which flash back at any degree of valve opening to the container shall be classed as highly flammable.

3.2 Modified Tag Open-Cup Test

3.2.1 *Apparatus* — *See* Fig. 2.

3.2.1.1 *Tagliabue open-cup tester* — Standard type with the addition of some means, preferably an open vessel to contain dry ice to chill the aerosol unit.

3.2.1.2 *Tag gas flame testing burner*

3.2.1.3 *Flash test thermometer*

3.2.1.4 *A heat source*

3.2.2 *Conditioning* — Chill the aerosol unit (filled as for use), flash cup and the bath solution to —32°C.

3.2.3 *Procedure*

3.2.3.1 Use a Tagliabue open-cup tester and transfer into it the contents of a pressurized dispenser after the propellant gas has been allowed to escape.

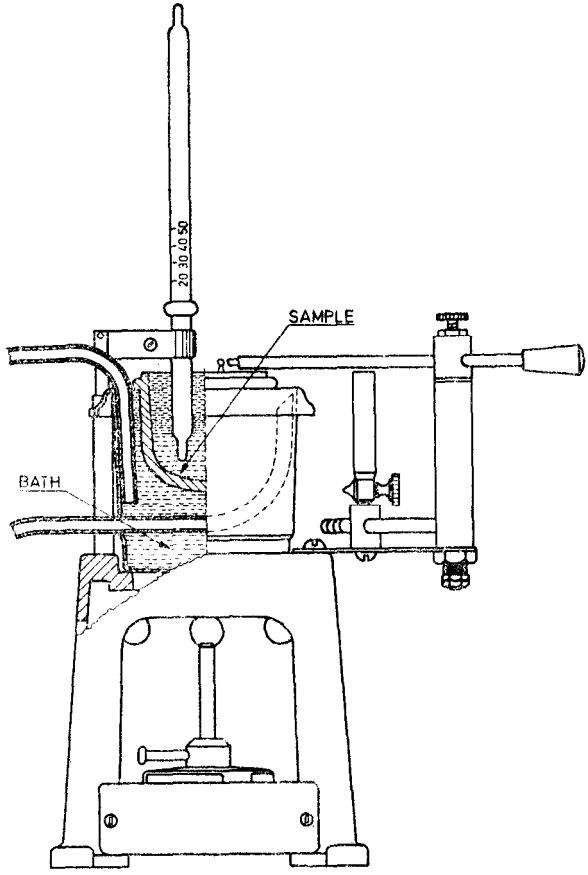


FIG. 2 TAG OPEN-CUP FLASH TESTER

3.2.3.2 A convenient way of preparing the contents to be transferred to the tag open-cup is to chill the aerosol filled as for use to a temperature of about —32°C and pierce the top of the dispenser when in an upright position with a very fine hole which shall allow the propellant to escape.

3.2.3.3 After a few minutes the pierced hole may be enlarged and as soon as there is no further evidence of gas escaping, the top of the dispenser should be cut open and the contents allowed to stand until the temperature is 15°C.

3.2.3.4 Flash cup and the bath solution (brine or glycol) is chilled to a temperature of —32°C and the material is then poured into the Tag open-cup until the cup is filled to the test line.

3.2.3.5 The test liquid is allowed or caused to increase in temperature at a rate of about 1°C per minute and test flame taper passed across the cup at intervals of 1°C until the test sample has evaporated completely.

NOTE — This procedure is not applicable to products in which the presence of solid portion prevents the transfer of a uniform specimen to the cup at —32°C.

3.2.4 *Classification*

3.2.4.1 Material which drops 6 mm in volume from the initial starting line and has not developed a flash would be recorded as having no flash under the condition of test.

3.2.4.2 Materials which flash below 38°C would be considered flammable.

3.2.4.3 Materials which flash below 150°C but above 38°C would be considered as combustible.

3.3 Closed Drum Test

3.3.1 *Apparatus*

3.3.1.1 *Drum* — A 200-litre open head drum or similar container fitted with a hinged cover over the open end, arranged so that it shall open readily at a pressure of about 0·3 bar. The cover does not have to fit airtight (*see* Fig. 3).

The closed or solid end is equipped with three shuttered openings (top, side and base of the solid end) for introduction of the spray. These openings are approximately 50 mm from the edge and are of 25 mm in diameter. The side opening 50 mm from the edge, is at the mid-point between the top and bottom of the drum.

In the centre of the closed end 150 mm square opening is cut and a piece of safety glass attached, to permit looking into the container.

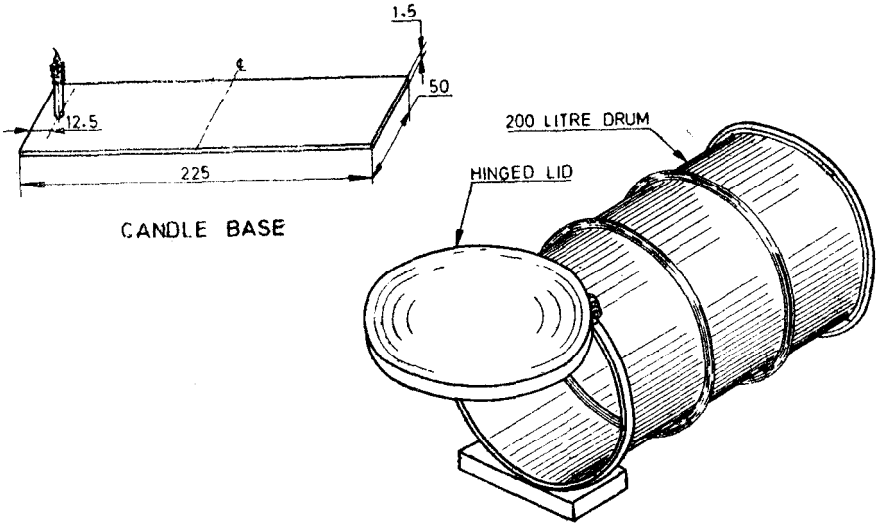
3.3.1.2 *A small flame* — such as a plumber's candle, placed midway between the ends on lower side of drum, which is on its side (*see* Fig. 3).

3.3.2 *Conditioning* — Condition the dispenser to 21 ±1°C.

3.3.3 *Procedure*

3.3.3.1 Place the drum out in the open when the temperature is between 15 to 27°C, but as close to 21°C as possible.

3.3.3.2 Stand the candle on the metal base in the drum, half way from each end.



All dimensions in millimetres.

FIG. 3 CLOSED DRUM TEST

3.3.3.3 Light the candle and secure the closure.

3.3.3.4 Shake the dispenser and hold it upright or if necessary in such a position that the liquid contents can be sprayed directly into the drum.

3.3.3.5 As quickly as possible, place the dispenser at the 25 mm opening and spray directly into the drum, directing the spray toward the centre of the opposite end, until an explosion takes place, or for a period up to 60 seconds whichever occurs first.

3.3.3.6 After each test, open the drum to clear the atmosphere, and clean the drum of any residues which might affect future tests.

3.3.3.7 Repeat **3.3.3.1** to **3.3.3.6** twice again and average the three results using the same dispenser if possible. If size limitations make it necessary to use more than one dispenser then do not use more than one in the performance of any one test.

3.3.4 *Classification* — Any explosion or rapid burning of the vapour-air mixture sufficient to cause the hinged cover to move in closed drum test shall be sufficient to class the unit tested as flammable.